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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/821,478	03/29/2001	Hung Yip Ng	FIS9-2000-0192	5481

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EXAMINER	
SAGAR, KRIPA	
ART UNIT	PAPER NUMBER
1756	10

DATE MAILED: 05/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action	Applicati n No.	Applicant(s)	
	09/821,478	NG, HUNG YIP	
	Examiner	Art Unit	
	Kripa Sagar	1756	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 16 April 2003 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection. ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. ☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.

2. ☐ The proposed amendment(s) will not be entered because:

   (a) ☐ they raise new issues that would require further consideration and/or search (see NOTE below);

   (b) ☐ they raise the issue of new matter (see Note below);

   (c) ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

   (d) ☐ they present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____.

3. ☐ Applicant's reply has overcome the following rejection(s): _____.

4. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

5. ☐ The a)☐ affidavit, b)☐ exhibit, or c)☐ request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

6. ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.

7. ☒ For purposes of Appeal, the proposed amendment(s) a)☐ will not be entered or b)☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

   The status of the claim(s) is (or will be) as follows:

   Claim(s) allowed: *none*.

   Claim(s) objected to: *none*.

   Claim(s) rejected: *1,3-8,10-14 and 16-20*.

   Claim(s) withdrawn from consideration: _____.

8. ☒ The proposed drawing correction filed on *12 November 2002* is a)☒ approved or b)☐ disapproved by the Examiner.

9. ☐ Note the attached Information Disclosure Statement(s)(PTO-1449) Paper No(s). _____.

10. ☒ Other: *detailed action*

DETAILED ACTION

Response to Amendment

1. The amendment filed on 4/16/03 has been entered.

Claims 1,3,4,8,10,14,16,19-20 have been amended; no new matter has been added. Claims 2,9,15 have been cancelled.

Claims 1,3-8,10-14,16-20 are pending.

Drawings

2. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 11/12/02 has been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat. 6174818 to Tao et al. in view of US Pat. 5783101 to Ma et al. and further in view of US Pat. 6297166 to Horak et al.

The invention discloses a method of compensating for nested-to-isolated pattern bias. Positive bias is compensated for by adding a sputtering component to the etch chemistry, while negative bias is adjusted for by the electrical bias on the substrate ("space charge" effect).

The instant claims recite providing a structure with a first critical dimension (CD) and lithographically reducing the CD by an O2-containing trimming etch. The claims further recite correcting the CD-bias between nested and isolated features during a plasma-etch and the etching parameters for the process.

Tao teaches a method of narrowing gate electrodes on a device. The steps comprise (a) forming a stack layer and patterning the photoresist, (b) optionally trimming the resist pattern (c) etching the anti-reflection coating (ARC) and hardmask and trimming the hard mask to a sub-lithographic dimension (if not trimmed by the photoresist) and (d) etching the gate to the desired sub-lithographic dimension. These are shown in Figs. 2-6. Tao uses an O2-containing gas in the plasma etching process (3;43-52). Tao teaches a method of narrowing gate electrodes on a device. The steps comprise (a) forming a stack layer and patterning the photoresist, (b) optionally trimming the resist pattern (c) etching the anti-reflection coating and hardmask and trimming the hard mask to a sub-lithographic dimension (if not trimmed by the photoresist) and (d) etching the gate to the desired sub-lithographic dimension. These are shown in Figs. 2-6. Tao uses an O2-containing gas in the plasma etching process (3;43-52). Tao discloses that the use of NF3 as an etchant species is known in prior art(1;52-58)

It does not teach correcting for the CD-bias, the magnitude of the correction or the etching parameters used. It does not specify positive or negative resists. Tao's layers include an oxide layer and an ARC but do not contain TEOS.

Ma teaches that CD-bias or "profile microloading" is known in prior art (1;60-2;21). The prior-art process corrects for the microloading effect by adjusting the RF power (and hence the space charge). Note that the resist sputtering effect is also adjustable by adjusting the frequency of the RF power (2;32-64). Ma's invention discloses further adjusting the etch parameters to correct for the CD bias. These include lowering the frequency (Fig.5) and increasing the RF power (3;10-27). The system is operated at 0-100mT (5;45-49).

Ma does not specify positive or negative photoresists (claims 2,4) or the extent of lateral trimming (claim 5) by the etch.

The choice of the photoresist and the adjustment of the trim are uniquely determined by the process. These are based on empirical data and process control techniques instituted on the manufacturing line. This is also taught by Horak who provides the concept for trimming the resist and ARC (anti-reflective coating) to compensate for the nested-isolated *etching bias* of the gate (6;49-7;44). It teaches that nested-iso *print bias* is also corrected by this process (7;45-67). The etch chemistries are adjusted between the sputtering and etching species to bring about the variable etch rates (fig.5-8).

Horak, Ma and Tao solve the problem of etch bias and attempt to form narrow gates with consistent CDs. It would have been obvious to one of ordinary skill in the art

at the time the invention was made to compensate for the etch bias of nested and isolated lines by biasing the etch-masks, as taught by Horak, using the teachings of Ma and Horak to set the etching parameters in Tao's trimming process because Ma teaches that varying the above mentioned parameters reduces microloading and increases the process window (3;15-27) while Horak teaches that this facilitates the design process for producing consistent products (2;45-65).

Response to Arguments

5. Applicant's arguments filed 4/16/03 have been fully considered but they are not persuasive.

Applicant has argued that (a) Tao does not teach etching to correct a nested-iso offset bias (b) Ma only teaches etching to prevent microloading and (c) Horak's teaching is directed to correcting an etching bias that is subsequent to the process (d) there is no motivation to combine the teachings (e) any suggestion to combine is based on hindsight and (f) the combination will not produce the instant invention

In response to applicant's arguments against the references individually (a,b,c), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Both Ma and Tao address the problem of CD-bias during etching. Ma further teaches the concept of microloading in dense patterns and the prior art efforts to minimize microloading. These were clearly indicated in the prior rejection.

The arguments are further refuted by Horak which teaches biasing the mask-etch to bring about consistent gate widths in dense and sparse regions.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation for combining Tao, Ma and Horak arises from the fact that all are addressing the problem of correcting an etch-bias.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). The art of correcting for etching bias between nested and isolated features has been in routine practice as noted by Horak and Ma.

6. In response to applicant's argument that the teachings of Tao, Ma and Horak will not lead to the instant invention, the test for obviousness is not whether the features of a

secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks
April 28, 2003

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700